FINAL REPORT
BENTHIC MACROINVERTEBRATE SURVEY
LAUREL RIVER PROJECT
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FOR
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NASHVILLE DISTRICT

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EXECUTIVE SUMMARY

On August 26 and 27, 1997, personnel from the Nashville District, Corps of Engineers Water Management Section (Hydrology and Hydraulics Branch, Engineering-Planning Division) collected water quality and benthic macroinvertebrate samples from five locations (Lynn Camp Creek Mile 2.1, Little Laurel River Mile 1.5, Laurel River Mile 27.9, Laurel River Mile 2.2 and Craig Creek Mile 8.7) in the Laurel River Drainage.

Benthic macroinvertebrate community structure at each location and comparison of the sites were assessed using: taxa richness, Shannon's Index of Diversity, evenness, percent contribution of dominant taxa, EPT taxa, scraper and filtering collectors ratio, EPT to Chironomidae abundance ratio, Hilsenhoff's Biotic Index, Jaccard's Coefficient and percent similarity. Cluster analyses were accomplished using 1-Jaccard's Coefficient and percent dissimilarity. The clusters were interpreted graphically to relate similar communities. The number of organisms and taxa per Hess were also evaluated statistically using analyses of variance and means separation testes.

A minimum of 101 species of benthic macroinvertebrates were taken from the five stations with 42 species from Lynn Camp Creek Mile 2.1, 50 from Little Laurel River Mile 1.5, 40 species from Laurel River Mile 27.9, 31 species from Laurel River Mile 2.2, and 18 species from Craig Creek Mile 8.7. In terms of density, Laurel River Mile 27.9 had the highest number of individuals with a density of 21, 270 individuals/m^2 followed by Lynn Camp Creek Mile 2.1 (12,338.8/m^2), Laurel River Mile 2.2 (5918.5/m^2) and Little Laurel River (5203/m^2). Craig Creek Mile 8.7 had the lowest with 111 individuals/m^2.

All sites, except Craig Creek Mile 8.7 were fairly species rich and diverse with benthic faunas representative of "Fair to Good" water quality. Craig Creek Mile 8.7 had significantly fewer species and reduced populations when compared to the other four stations. The two Laurel River sites were significantly different in number of species present when compared to all other sites while Lynn Camp Creek and Little Laurel River were comparable to each other but significantly greater than the other three sites. Although Craig Creek Mile 8.7 had few species and individuals, the species present are indicative of "Good to Very Good" water quality with little or no apparent organic pollution.

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INTRODUCTION

On August 26 and 27, 1997, personnel from the Nashville District, Corps of Engineers Water Management Section (Hydrology and Hydraulics Branch, Engineering-Planning Division) collected water quality and benthic macroinvertebrate samples from five locations in the Laurel River Drainage. The Water Management Section maintains a baseline, water quality data collection and monitoring program. A wide range of physical, chemical and biological data is collected, analyzed and reported from various locations representing tailwaters, impounded sites and reservoir inflows for the ten Nashville District reservoirs in the Cumberland River Basin. During 1997, biological data collections included extensive quantitative sampling for benthic macroinvertebrates at eight of the ten Cumberland River Basin projects.

SAMPLING LOCATIONS

Sampling locations in the Laurel River Basin are shown in Figure 1. The following is a brief description of the five benthic macroinvertebrate sampling sites.

3LAU10001- Laurel River Mile 2.2, Latitude $36^0$57’39”, Longitude $84^0$16’13”, tailwater location.

3LAU10011- Little Laurel River Mile 1.5, Latitude $37^0$00’49”, Longitude $84^0$06’54”, inflow location.

3LAU10014 – Craig Creek Mile 8.7, Latitude $37^0$01’08”, Longitude $84^0$10’48”, inflow location.

3LAU10015 – Lynn Camp Creek Mile 2.1, Latitude $36^0$57’49”, Longitude $84^0$06’12”, inflow location.

3LAU10023 – Laurel River Mile 27.9, Latitude $37^0$00’05”, Longitude $84^0$06’03”, inflow location.

BACKGROUND

As found in other similar studies, the alteration of the physical or chemical norms of an aquatic environment has the potential to influence nearly all organisms residing in that environment (Goodnight 1973). A community represented by numerous species with no particular numerical domination evident in the population is usually indicative of an unstressed environment (Weber 1973, Klemm etal. 1990). Conversely, a benthic community composed of a few species with large numbers of individuals typifies a stressed community from which intolerant species have been reduced or eliminated by a pollutant or substrate change. The populations of tolerant species expand due to reduced competition or increased resources, or both. The often dramatic benthic community shifts, which can occur in stressed ecosystems, are due to the varying sensitivities of the different macroinvertebrate species. Mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera) or EPT species, which spend most of their lives in an aquatic environment, are generally less tolerant of most types of pollution, whereas many flies (Diptera) and worms (Oligochaeta) are more tolerant of environmental stress conditions (Brinkhurst 1962, Beck 1977, Mason 1971, and Merritt and Cummins 1996). Stream reaches may be divided into several ecological categories depending upon whether or not they are subject to stressful agents and, if they are, to what extent or type. They can also be divided into these categories on the basis of the benthic fauna that is supported in that reach.

Attention is usually focused on the macroinvertebrate species because they are more indicative of the relative health of a stream. In addition, macroinvertebrates are found in all habitats, less mobile than other groups of aquatic organisms, easily collected, and most have relatively long periods of development in the aquatic environment. Thus, macroinvertebrate species can be used to indicate deleterious events that have occurred in an aquatic system during any stage of their development.

Clean water streams with variable habitat features often have a high diversity of species with each species represented by a few individuals. Streams receiving organic pollution generally show a decrease in diversity and an increase in density (Gaufin and Tarzwell 1956),

while streams receiving toxic products frequently show a decrease in both diversity and density (Cairns et al., 1971).

Increased sedimentation in streams is a problem most often the result of poor agriculture practices and construction activity in the vicinity streams (Waters, 1995). The effects of increased sedimentation vary, but the primary effect is habitat loss caused by the filling of cracks and crevices with sand and silt and general decrease in habitat diversity.

MATERIALS AND METHODS

At each station, five replicate quantitative samples were taken with 500 micron mesh Hess Sampler (0.09 m^2) from the riffle/run habitat of the stream. Organisms within each area encompassed by the Hess were collected by physically detaching them from the substrate (usually by hand picking or gently sweeping substrate materials with a brush) or by agitating the substrate and allowing the current to carry dislodged organisms into the net. No sorting of organisms and debris was attempted in the field. Organisms and debris were carefully transferred into a storage jar and the entire contents preserved with formalin. Labels bearing unique numbers were applied to the exterior of the jars. These numbers and associated information were then recorded on a chain of custody form. All samples were returned to the Nashville District's Water Management Support Center for storage before delivery to Pennington and Associates, Inc. Storage times ranged from a maximum of eight months to a minimum of four months. No deterioration of sample quality was observed during this holding time.

In the laboratory, all benthic samples were washed in a 120 micron mesh screen. After washing, the macroinvertebrates were removed from the detritus under 5x magnification and preserved in 85% ethanol. The organisms were identified to the lowest practical taxonomic level using available keys (Pennington and Associates, Inc. 1994) and counted. Identifications were made with a stereomicroscope (7X to 60X). Slide mounts were made of the chironomids, simuliids, oligochaetes and small crustaceans, and identifications were made with a compound microscope. The chironomids, simuliids, and oligochaetes were cleared for 24 hours in cold 10% KOH. Temporary mounts were made in glycerine and the animals returned to 80% ethanol after identification. When permanent mounts were desired, the organisms were transferred to 95% ethanol for 30 minutes and mounted in euperol.

SUBSTRATE DETERMINATION

A classification of substrate based on the size scale proposed by Wentworth (Compton 1962) was used to make field observations of the substrate present at each station. This classification of detrital sediments is by grain diameter and is as follows:

Diameters	Approximate Inch Equivalents	Name of Loose Aggregate
>256 mm	>10 inch	Boulder
64 to 256 mm	2.5 to 10 inch	Cobble
2 to 64 mm	0.08 to 2.5 inch	Gravel
1/16 to 2 mm	0.002 to 0.08 inch	Sand
1/256 to 1/16 mm	0.00015 to 0.002 inch	Silt
<1/256 mm	<0.00015 inch	Clay

Substrate types encountered at the five sites vary somewhat. In general substrate types are dominated by cobble and boulders with relatively minor amounts of finer grained materials (gravel, sand, silt and clay).

COMMUNITY STRUCTURE MEASURES

Brower and Zar (1984) provide a detailed discussion of a variety of techniques for measuring community structure. The use of diversity indices is based upon the observation that normally undisturbed environments support communities with large numbers of species having no individuals present in overwhelming abundance. If the species of a disturbed community are ranked by numerical abundance, there may be relatively few species with large numbers of individuals. Mean diversity is affected by both "richness" of species (or abundance of different species) and by the distribution of individuals among the species. High species diversity indicates a highly complex community.

Species diversity was estimated using Shannon's Index of Diversity (H):

$$H = - \sum p_i \log p_i$$

where p_i is the proportion of the total number of individuals occurring in species i ($p_i=n_i/N$), N is the total number of individuals in all species.

Diversity indices take into account both the species richness and the evenness of the individuals' distribution among the species. Separate measures of these two components of diversity are often desirable. Species richness can be expressed simply as the number of species in the community. Evenness may be expressed by considering how close a set of observed species abundance are to those from an aggregation of species having maximum possible diversity for a given N and s (Brower and Zar 1984).

Evenness is calculated as follows:

$$\text{Pielou } J' = H/H_{max}$$

where H is calculated diversity and H_{max} is maximum possible diversity.

Community similarity between sites is measured by Jaccards Coefficient, Community Loss Index, and Percent Similarity.

$$\text{Jaccards Coefficient} = \frac{C}{S_1 + S_2 - C}$$

$$\text{Community Loss Index} = \frac{S_1 - C}{S_2}$$

where S = Species in each community (S_1 is reference Community in Community loss Index)

C = Species common to both communities

The Community Loss Index is an index of dissimilarity with values increasing as the degree of dissimilarity from the reference station (S_1) increases (Plafkin et al. 1989). Values

range from 0 to infinity. Community Loss was not calculated because no station was designated as a reference site.

Percent Similarity, for a two-community comparison, is calculated as follows: The number of individuals in each species is calculated as a fractional portion of the total community. The value for species i in community 1 is compared to the value for species i in community 2. The lower of the two is tabulated. This procedure is followed for each species. The tabulated list (of the lower of each pair of values) is summed. The sum is defined as the Percent Similarity of the two communities.

The software package Number Cruncher Statistical Systems version 5.03 was used to evaluate community similarity (Hintze 1992). Cluster analysis sorts sampling units into groups based on the overall resemblance to each other (Lundwig and Reynolds 1988). By using 1-Jaccards Coefficient and Percent Dissimilarity, sampling units are sorted to permit grouping. The cluster analysis combines the distances between sampling units into a matrix table, and two strategies of clustering are used to calculate a distance for N-1 cycles (N=number of sampling units). The cluster analysis is interpreted graphically on a dendrogram to relate the similar communities (Hintze 1992, Ludwig and Reynolds 1988).

The percent contribution of the numerically dominant taxon to the total number of organisms in the community is a rough measure of community balance at the lowest possible taxonomic level (Plafkin et al. 1989). A community that is dominated by a few species may be under environmental stress.

The total number of species within the pollution sensitive groups Ephemeroptera, Plecoptera, and Trichoptera is generally considered a measure of water quality and is listed as the EPT Index (Plafkin et al. 1989). The EPT Index generally increases with increasing water quality.

According to Plafkin et al. (1989) the scraper and filtering collector ratio (Sc/FC) reflects the riffle/run community food base and may provide insights into the nature of potential disturbance factors. The ratio of scraper abundance to the combined totals of scrapers and filtering collectors (scrapers / scrapers and filtering collectors) is an adjustment of the scrapers / filtering collectors from a ratio to a measure of percent contribution (Barbour et al. 1992).

The ratio of shredder functional feeding group and total number of individuals (Sh/Total) in the CPOM sample allows evaluation of potential impairment as indicated by the shredder community. Shredders are considered sensitive to riparian zone impacts and are believed to be good indicators of toxic effects when toxicants are absorbed by or associated with the course particulate organic matter (CPOM) (Plafkin et al 1989). This metric was not included in this study because no CPOM samples were obtained at each station.

The EPT and Chironomidae abundance ratio (EPT/Chironomidae) is the relative abundance of the pollution sensitive groups Ephemeroptera, Plecoptera, and Trichoptera to the more tolerant Chironomidae as a measure of community balance (Plafkin et al. 1989). It is believed that good biotic condition is reflected in benthic communities with an even distribution of species among all four major groups and with substantial representation of Ephemeroptera, Plecoptera, and Trichoptera. Populations with a disproportional number of Chironomidae relative to the sensitive groups are most likely an indication of environmental stress (Plafkin et al. 1989).

A scoring approach developed by Plafkin et al. (1989) to estimate community health utilizes many of the community measures previously discussed. This rapid bioassessment is presented in flow chart format in Figure 2.

Metric	Biological Condition Scoring Criteria			
	6	4	2	0
1. Taxa Richness[a]	>80%	60-80%	40-60%	<40%
2. Hilsenhoff Biotic Index (modified)[b]	>85%	70-85%	50-70%	<50%
3. Ratio of Scrapers/Filt. Collectors[a,c]	>50%	35-50%	20-35%	<20%
4. Ratio of EPT and Chironomid Abundance[a]	>75%	50-75%	25-50%	<25%
5. % Contribution of Dominant Taxon[d]	<20%	20-30%	30-40%	>40%
6. EPT Index[a]	>90%	80-90%	70-80%	<70%
7. Community Loss Index[e]	<0.5	0.5-1.5	1.5-4.0	>4.0
8. Ratio of Shredders/Total[a,c]	>50%	35-50%	20-35%	<20%

[a] Score is a ratio of study site to reference site X 100.
[b] Score is a ratio of reference site to study site X 100.
[c] Determination of Functional Feeding Group is independent of taxonomic grouping.
[d] Scoring criteria evaluate actual percent contribution, not percent comparability to the reference station.
[e] Range of values obtained. A comparison to the reference station is incorporated in these indices.

BIOASSESSMENT		
% Comp. to Ref. Score[a]	Biological Condition Category	Attributes
>83%	Nonimpaired	Comparable to the best situation to be expected within an ecoregion. Balanced trophic structure. Optimum community structure (composition and dominance) for stream size and habitat quality.
54-79%	Slightly impaired	Community structure less than expected. Composition (species richness) lower than expected due to loss of some intolerant forms. Percent contribution of tolerant forms increases.
21-50%	Moderately impaired	Fewer species due to loss of most intolerant forms. Reduction in EPT index.
<17%	Severely impaired	Few species present. If high densities of organisms, then dominated by one or two taxa.

[a] Percentage values obtained that are intermediate to the above ranges will require subjective judgement as to the Correct placement. Use of the habitat assessment and physiochemical data may be necessary to aid in the decision Process.

Figure 2. Biological Condition Scoring Criteria (Plafkin et al. 1989)

BIOTIC INDEX

Both the evenness and diversity indices are based on information of community structure and do not reflect any knowledge of the physiological attributes or ecological affinities of the organisms comprising the community (Howmiller and Scott 1977). Howmiller and Scott (1977) suggest the use of a trophic index for assessing ecological stress using Oligochaete species. After a two-year study of 53 Wisconsin streams, Hilsenhoff (1982) proposed using a biotic index of arthropod populations as a rapid method for evaluating water quality. Hilsenhoff (1987) expanded and improved his biotic index and this index, which is a measure of organic and nutrient pollution, was used in this study.

To calculate the biotic index, species are assigned pollution tolerance values of 0 to 10. A value of 0 is assigned to species found only in unaltered streams of very high water quality, and a value of 10 is assigned to species known to occur in severely polluted or disturbed streams. Intermediate values are assigned to species that occur in streams with intermediate degrees of pollution or disturbance. Where species cannot be identified, genera are assigned values instead. The biotic index is calculated from the formula:

$$BI = \sum \frac{n_i a_i}{N}$$

where n_i is the number of individuals of each species, a_i is the tolerance value assigned to that species and N is the total number of individuals in the sample (Hilsenhoff 1982). The index is an average of tolerance values, and measures saprobity (pertaining to tolerance of organic enrichment) and to some extent trophism.

According to Hilsenhoff (1987) the calculated Biotic Index values reflect the following:

Biotic Index	Water Quality	Degree of Organic Pollution
0.00 - 3.50	Excellent	No apparent organic pollution
3.51 - 4.50	Very Good	Possibly slight organic pollution
4.51 - 5.50	Good	Some organic pollution
5.51 - 6.50	Fair	Fairly significant organic pollution
6.51 - 7.50	Fairly Poor	Significant organic pollution
7.51 - 8.50	Poor	Very significant organic pollution
8.51 - 10.00	Very Poor	Severe organic pollution

In response to previous requests of the Tennessee Department of Environment and Conservation, Division of Water Pollution Control, Biotic Index values are calculated using tolerance values provided in North Carolina Department of Environment, Health and Natural Resources, Division of Environmental Management Water Quality Section, Standard Operating Procedures Biological Monitoring, Environmental Sciences Branch Ecosystems Analysis Unit, Biological Assessment Group, January, 1997 (North Carolina, Department of Environment, Health and Natural Resources 1997).

Since North Carolina provides water quality classifications for Biotic Index values based on three geographic regions (mountains, piedmont and coastal) it is probably more appropriate to use scoring criteria for the piedmont region. North Carolina's scoring criteria for water quality assessment for the piedmont region are as follows:

NC Biotic Index (Piedmont)	Water Quality
< 5.19	Excellent
5.19 - 5.78	Good
5.79 - 6.48	Good - Fair
6.49 - 7.48	Fair
> 7.48	Poor

STATISTICAL EVALUATION

Sampling efficiency of the field techniques was calculated via a statistical analysis of the quantitative samples. The mean number of organisms per sample, the standard deviation, the standard error, and the sampling precision of the mean were calculated for the benthic samples from each station (Elliot 1977). The sampling precision is the primary parameter evaluated and represents the percentage of the actual mean of the population within which the sample mean lies and indicates how accurately the macroinvertebrate community was sampled. According to Elliot (1977), a sampling precision of 20% (80% confidence) or less is usually acceptable in biological studies. The sampling precision (D) is the ratio of the standard error to the arithmetic mean:

$$D = (S.E./Mean)\ 100$$

Since five quantitative samples were taken in each area, some of the population estimates may not be sampled with 80% or greater confidence. As stated by Elliot (1977), the simplest solution to this problem is to take many samples (over 50 samples), but this is not usually an acceptable allocation of resources.

An analysis of variance (F test) was used to compare the stations using the number of organisms and species per sample. According to Sokal and Rohlf (1981), analysis of variance is a technique in statistics where the total variation in a set of data is partitioned into components associated with possible sources of variability. The relative importance of the different sources

is then assessed by F-tests between each component of variation and the "error" variation. If the calculated F-value is greater than the tabular F-value at the 0.05 level of significance, then a difference between data sets is greater than the variation within a data set. Following the approach of Chew (1977), mean separation tests are applied to separate and rank the mean values of each data set developed from benthic enumeration.

RESULTS AND DISCUSSION

A list of all aquatic benthic macroinvertebrate species, assigned tolerance values, functional feeding groups and numbers of individuals of each species collected from each stream location are presented in Table 1. Complete listings of all data by sample, station and month are found in the Appendix. A summary of benthic community measures is resented in Table 2. A statistical analyses of sampling efficiency and a comparison of the stations using mean number of organisms per Hess Sampler is presented in Table 3. A similar comparison using mean number of species per Hess Sampler is found in Table 4. A comparison of the stations using Percent Dissimilarity is in Figure 2 while similar comparisons using 1-Jaccard's Coefficient is clustered in Figure 3.

A minimum of 101 species of benthic macroinvertebrates was taken from the five stations within the Laurel River Project area (Table 1, Appendix). The collections were represented by five phyla, 10 classes and 46 families of aquatic organisms. In terms of number of species at each of the five locations, Little Laurel Mile 1.5 (3LAU10011) yielded the highest number of species (50) followed by Lynn Camp Creek Mile 2.1 (3LAU10015) with 42 species and Laurel River Mile 27.9 (3LAU10023) with 40 (Tables 1 and 2). Craig Creek Mile 8.7 (3LAU1014) had the lowest number of species with 18.

In terms of density (Table 1), Laurel River Mile 27.9 had the highest number of individuals with a density of 21,270 individuals/m2 followed by Lynn Camp Creek Mile 2.1 (12338.8/m^2), Laurel River Mile 2.2 (5918.5/m^2), and Little Laurel River (5203/m^2). Craig Creek Mile 8.7 had only 111 organisms/m^2.

Lynn Camp Creek Mile 2.1 (3LAU10015) had 5558 individuals of macroinvertebrates in the Hess samples or 12,338.8/m^2 (Table 1) representing a minimum of 42 species. The introduced Asian clam, *Corbicula fluminea* was the dominant species representing 39.2% of the individuals present at this location. The chironomids, *Polypedilum convictum* (17.1%0, *Conchapelopia sp*. (9.8%) and *Dicrotendipes sp*. (7.3%) were also abundant and made up a significant component of the benthic fauna. The net-spinning caddisfly *Cheumatopsyche sp.* contributed 3.9% of the individuals to the benthic fauna at this location. There were 10 species of EPT (Ephemeroptera, Plecoptera and Trichoptera which are considered sensitive to environmental degradation) at Lynn Camp Creek Mile 2.1 with only Little Laurel River Mile 1.5 having more (14). The biotic index value calculated for this location was 6.32, indicative of

waters of "Good to Fair" conditions with some to significant organic pollution. Shannon Diversity at this site was 3.09, which is indicative of a fairly diverse community.

Little Laurel River Mile 1.5 (3LAU10011) had at least 50 species of macroinvertebrates and 2344 individuals (5203.7/m^2) in the five Hess samples (Table 1). The chironomid *Rheotanytarsus sp*. was the most common species representing 21.5% of the individuals present. The mayfly *Stenonema sp*. (16.6%), the net-spinning caddisfly *Cheumatopsyche sp*. (15%) and the chironomids *Polypedilum convictum* (8%) and *Microtendipes sp*. (7.6%) were also abundant in the aquatic community. There were 14 species of EPT species taken at this location, the most for any site in the Laurel River project area. The biotic index value for this location (5.47) is indicative of "Good" water quality conditions with some organic pollution. The Shannon Diversity value for this site was the highest (3.8) in the project area and is indicative of a very diverse community with no one species dominating the community structure.

Laurel River Mile 27.9 (3LAU10023) had the highest density, 47219/m^2 (Table 1) with most of the individuals belonging to the midge *Rheotanytarsus sp*. (66%). The high number of *Rheotanytarsus sp*. also causes a reduction of the diversity (2.78) and evenness (0.5) values (Table 2). There were a minimum of 40 species and eight EPT species in the Hess samples. The biotic index value (5.8) at this location is indicative of "Fair to Good" water quality with "some to fairly significant organic pollution".

The location designated as Laurel River Mile 2.2 (3LAU10001) had 31 species and a density of 5918.5 individuals/m^2 (Table 1). The chironomid *Eukiefferiella devonica gp*. (33%) and the worm *Nais sp*. (30.7%) were the most abundant species in the benthic fauna at this site. Only two EPT species were taken at Laurel River Mile 2.2 (Table 1). The biotic value (6.23) is indicative of "Fair to Good" water quality with "some to fairly significant organic pollution". The Shannon Diversity value 2.93 represents a fairly diverse fauna although two species were dominant in the fauna.

Craig Creek Mile 8.7 (3LAU10014) had a reduced fauna with 18 species of macroinvertebrates and an estimated 111 individuals/m^2 (Table 1). Although Craig Creek at this location supports a limited fauna, 9 species of EPT species were taken in the Hess samples and the biotic index value (3.9) is indicative of "Good to Very Good" water quality with little or no apparent organic pollution. The Shannon Diversity value (3.51) indicates a fairly even distribution of individuals among the species.

A statistical comparison of the sites using mean number of individuals per Hess sample (Table 3) places Laurel River Mile 27.9 with significantly more individuals than Craig Creek Mile 8.7, Little Laurel Mile 1.5 and Laurel River Mile 2.2, but not significantly different from Lynn Camp Creek Mile 2.1. Craig Creek, Little Laurel, Laurel River Mile 2.2 and Lynn Camp Creek were not significantly different using mean number of organisms.

A statistical comparison of the sites using mean number of species per Hess sample (Table 4) has Craig Creek Mile 8.7 with significantly less species than all other sites. Laurel River Mile 2.2 with significantly fewer species than Laurel River Mile 27.9, Lynn Camp Creek Mile 2.1 and Little Laurel River Mile 1.5. Laurel River Mile 27.9 had significantly less than Lynn Camp Creek Mile 2.1 and Little Laurel River Mile 1.5. Lynn Camp Creek Mile 2.1 and Little Laurel River Mile 1.5 were not significantly different.

A comparison of the five stations using percent similarity (Figure 2) has Lynn Camp Creek Mile 2.1 clustering first with Little Laurel River Mile 1.5 and secondly with Little Laurel River Mile 27.9. The third cluster consisted of Laurel River Mile 2.2 and Craig Creek Mile 8.7. In terms of species shared using Jaccard's Coefficient (Figure 3), Lynn Camp Creek Mile 2.1 and Little Laurel River Mile 1.5 clustered first, Laurel River Mile 27.9 and Laurel River Mile 2.2 clustered second and Craig Creek Mile 8.7 clustered last.

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.												
SPECIES	**T.V.****	**F.F.G.*****	**Lynn Camp**		**Little Laurel**		**Laurel River**		**Laurel River**		**Craig Creek**	
			Creek Mile 2.1		**River Mile 1.5**		**Mile 27.9**		**Mile 2.2**		**Mile 8.7**	
			3LAU10015		**3LAU10011**		**3LAU10023**		**3LAU10001**		**3LAU10014**	
			Count	**Density**	**Count**	**Density**	**Count**	**Density**	**Count**	**Density**	**Count**	**Density**
COELENTERATA												
Hydrozoa												
Hydroida												
Hydridae												
Hydra sp.	***5**	**P**					30	66.6	51	113.22		
PLATYHELMINTHES												
Turbellaria												
Tricladida												
Planariidae												
Dugesia tigrina	**7.23**	**CG**					10	22.2				
NEMATODA			1	2.22	11	24.42						
MOLLUSCA												
Bivalvia												
Veneroida												
Corbiculidae												
Corbicula fluminea	**6.12**	**FC**	2177	4832.94	12	26.64	120	266.4				
Sphaeriidae												
Sphaerium sp.	**7.58**	**FC**					10	22.2			1	2.22
Gastropoda												
Mesogastropoda												
Pleuroceridae												
Elimia sp.	**2.46**	**SC**	16	35.52	3	6.66					1	2.22
Basommatophora												
Ancylidae												
Ferrissia rivularis	**6.55**	**SC**	111	246.42								
Physidae												
Physella sp.	**8.84**	**CG**	6	13.32	1	2.22						
ANNELIDA												
Oligochaeta												
Haplotaxida												
Enchytraeidae	**9.84**	**CG**							88	195.36		
Lumbricidae		**CG**			3	6.66						
Naididae												
Nais sp.	**8.88**	**CG**							37	82.14		

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.												
SPECIES	**T.V.****	**F.F.G.*****	**Lynn Camp**		**Little Laurel**		**Laurel River**		**Laurel River**		**Craig Creek**	
			Creek Mile 2.1		**River Mile 1.5**		**Mile 27.9**		**Mile 2.2**		**Mile 8.7**	
			3LAU10015		**3LAU10011**		**3LAU10023**		**3LAU10001**		**3LAU10014**	
			Count	**Density**	**Count**	**Density**	**Count**	**Density**	**Count**	**Density**	**Count**	**Density**
Nais behningi	**8.89**	**CG**					10	22.2				
Nais bretscheri	**8.88**	**CG**					1	2.22	819	1818.2		
Nais communis	**8.81**	**CG**					1	2.22	71	157.62		
Tubificidae w.o.h.c.	**7.11**	**CG**	5	11.1	8	17.76						
Lumbriculida												
Lumbriculidae	**7.03**	**CG**							27	59.94		
Hirudinea	***8**	**P**					10	22.2				
ARTHROPODA												
Arachnoidea												
Acariformes	**5.53**				3	6.66						
Hydrobatidae												
Atractides sp.	**5.53**				4	8.88	10	22.2				
Lebertiidae												
Lebertia sp.	**5.53**		5	11.1								
Sperchonidae												
Sperchon sp.					4	8.88	6	13.32				
Crustacea												
Isopoda												
Asellidae												
Caecidotea sp.	**9.11**	**CG**							29	64.38		
Lirceus sp.	**7.85**	**CG**			1	2.22						
Decapoda												
Cambaridae												
Orconectes sp.	**2.6**	**SH**			1	2.22						
Insecta												
Ephemeroptera												
Baetidae												
Acentrella ampla	**3.61**	**CG**									1	2.22
Baetis sp.	***4**	**CG**	2	4.44			10	22.2				
Baetis intercalaris	**4.99**	**CG**	56	124.32	22	48.84						
Caenidae												
Caenis sp.	**7.41**	**CG**	19	42.18	6	13.32						
Ephemeridae					6	13.32						

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.												
SPECIES	**T.V.****	**F.F.G.*****	**Lynn Camp**		**Little Laurel**		**Laurel River**		**Laurel River**		**Craig Creek**	
			Creek Mile 2.1		**River Mile 1.5**		**Mile 27.9**		**Mile 2.2**		**Mile 8.7**	
			3LAU10015		**3LAU10011**		**3LAU10023**		**3LAU10001**		**3LAU10014**	
			Count	**Density**	**Count**	**Density**	**Count**	**Density**	**Count**	**Density**	**Count**	**Density**
Ephemera sp.	***3**	**CG**			6	13.32						
Heptageniidae												
Stenacron interpunctatum	**6.87**	**SC**			1	2.22	8	17.76				
Stenonema sp.	***4**	**SC**	1	2.22	377	836.94	48	106.56			3	6.66
Stenonema vicarium	**1.26**	**SC**									13	28.86
Isonychiidae												
Isonychia sp.	**3.45**	**FC**	14	31.08	20	44.4	13	28.86			4	8.88
Tricorythidae												
Tricorythodes sp.	**5.06**	**CG**	65	144.3								
Odonata												
Aeshnidae												
Boyeria vinosa	**5.89**	**P**									1	2.22
Coenagrionidae												
Argia sp.	**8.17**	**P**	80	177.6								
Gomphidae												
Gomphus sp.	**5.8**	**P**	2	4.44								
Plecoptera												
Perlidae												
Acroneuria abnormis	**2.06**	**P**									1	2.22
Megaloptera												
Corydalidae												
Corydalus cornutus	**5.16**	**P**	3	6.66	116	257.52	26	57.72				
Nigronia sp.	**4.95**	**P**			3	6.66						
Nigronia serricornis	**4.95**	**P**	2	4.44	9	19.98					1	2.22
Trichoptera												
Helicopsychidae												
Helicopsyche borealis	**0**	**SC**	1	2.22								
Hydropsychidae			3	6.66	35	77.7	166	368.52				
Cheumatopsyche sp.	**6.22**	**FC**	217	481.74	352	781.44	1281	2843.8	3	6.66	2	4.44
Ceratopsyche sp.	***4**	**FC**			3	6.66						
Ceratopsyche morosa	***6**	**FC**			1	2.22						
Hydropsyche sp.	**6.22**	**FC**			31	68.82	30	66.6	1	2.22		
Hydropsyche betteni gp.	**7.78**	**FC**					140	310.8				
Hydroptilidae					3	6.66						

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.												
SPECIES	**T.V.****	**F.F.G.*****	**Lynn Camp**		**Little Laurel**		**Laurel River**		**Laurel River**		**Craig Creek**	
			Creek Mile 2.1		**River Mile 1.5**		**Mile 27.9**		**Mile 2.2**		**Mile 8.7**	
			3LAU10015		**3LAU10011**		**3LAU10023**		**3LAU10001**		**3LAU10014**	
			Count	**Density**	**Count**	**Density**	**Count**	**Density**	**Count**	**Density**	**Count**	**Density**
Hydroptila sp.	**6.22**	**PI**	28	62.16	7	15.54						
Limnephilidae												
Pycnopsyche sp.	**2.52**	**SH**									3	6.66
Philopotamidae												
Chimarra sp.	**2.76**	**FC**									10	22.2
Polycentropodidae												
Polycentropus sp.	**3.53**	**FC**									1	2.22
Coleoptera												
Dryopidae												
Helichus basalis	**4.63**	**CG**									1	2.22
Elmidae												
Ancyronyx variegata	**6.49**	**SC**					10	22.2				
Optioservus sp.	**2.36**	**SC**					20	44.4				
Stenelmis sp.	**5.1**	**SC**	20	44.4								
Hydrophilidae												
Berosus sp.	**8.43**	**CG**	13	28.86								
Psephenidae												
Psephenus herricki	**2.35**	**SC**	1	2.22								
Diptera												
Ceratopogonidae												
Atrichopogon sp.	**6.49**		1	2.22					1	2.22		
Chironomidae			223	495.06	71	157.62	701	1556.2	102	226.44		
Ablabesmyia mallochi	**7.19**	**P**			4	8.88						
Ablabesmyia parajanta	**7.37**	**P**					20	44.4				
Cardiocladius obscurus	**5.87**	**P**			7	15.54	64	142.08				
Conchapelopia sp.	**8.42**	**P**	544	1207.68	25	55.5	56	124.32	7	15.54		
Cricotopus sp.	***7**	**CG**			14	31.08	30	66.6	73	162.06		
Cricotopus bicinctus	**8.54**	**CG**	112	248.64					133	295.26		
Cricotopus tremulus	***7**	**CG**	12	26.64	18	39.96			218	483.96		
Cricotopus trifascia	**2.84**	**SH**							5	11.1		
Cryptochironomus fulvus	**6.38**	**P**	3	6.66								
Dicrotendipes sp.	**8.1**	**CG**	407	903.54	7	15.54	53	117.66	3	6.66		
Eukiefferiella claripennis gp.	**5.58**	**CG**							8	17.76		
Eukiefferiella devonica gp.	**2.59**	**CG**							880	1953.6	1	2.22

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.												
SPECIES	**T.V.****	**F.F.G.*****	**Lynn Camp**		**Little Laurel**		**Laurel River**		**Laurel River**		**Craig Creek**	
			Creek Mile 2.1		**River Mile 1.5**		**Mile 27.9**		**Mile 2.2**		**Mile 8.7**	
			3LAU10015		**3LAU10011**		**3LAU10023**		**3LAU10001**		**3LAU10014**	
			Count	**Density**	**Count**	**Density**	**Count**	**Density**	**Count**	**Density**	**Count**	**Density**
Glyptotendipes sp.	**9.47**	**FC**					40	88.8				
Microtendipes sp.	**5.53**	**CG**			179	397.38						
Nanocladius sp.	**7.07**	**CG**					10	22.2				
Nilothauma sp.	**3.9**	**CG**					3	6.66				
Orthocladius sp.	***4**	**CG**	1	2.22					28	62.16		
Orthocladius (Euorthocladius sp.)	***6**	**CG**					3	6.66	2	4.44		
Parachironomus sp.	**9.42**	**CG**					189	419.58				
Parakiefferiella sp.	**5.4**	**CG**	1	2.22								
Parakiefferiella bathophila	**5.4**	**CG**	10	22.2								
Parametriocnemus lundbecki	**3.65**	**CG**			12	26.64			10	22.2		
Phaenopsectra sp.	**6.5**	**SC**			7	15.54			23	51.06		
Polypedilum sp.	***7**	**SH**							3	6.66		
Polypedilum convictum	**4.93**	**SH**	948	2104.56	189	419.58	3396	7539.1	4	8.88		
Polypedilum halterale	**7.31**	**SH**	33	73.26	13	28.86						
Polypedilum illinoense	**9**	**SH**			27	59.94					2	4.44
Pseudochironomus sp.	**5.36**	**CG**							3	6.66		
Rheocricotopus sp.	**7.3**	**CG**			1	2.22						
Rheocricotopus robacki	**7.28**	**CG**			7	15.54						
Rheotanytarsus sp.	**5.89**	**FC**	269	597.18	505	1121.1	14094	31289	19	42.18		
Tanytarsus sp.	**6.76**	**FC**	54	119.88	52	115.44						
Thienemanniella xena	**5.86**	**CG**	7	15.54								
Thienemannimyia gp.	**8.42**	**P**			8	17.76					2	4.44
Tvetenia bavarica gp.	**3.65**	**CG**							2	4.44		
Zavrelia sp.	**5.3**	**CG**	1	2.22								
Empididae					9	19.98	20	44.4				
Chelifera sp.	***6**	**P**							1	2.22		
Hemerodromia sp.	**7.57**	**P**	1	2.22	8	17.76	250	555				
Muscidae	***8**	**P**							5	11.1		
Simuliidae							10	22.2				
Simulium sp.	**4**	**FC**	83	184.26	6	13.32	356	790.32	10	22.2	2	4.44
Tipulidae												
Antocha sp.	**4.25**	**CG**			126	279.72	5	11.1				
Tipula sp.	**7.33**	**SH**					10	22.2				

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.												
SPECIES	T.V.**	F.F.G.***	Lynn Camp		Little Laurel		Laurel River		Laurel River		Craig Creek	
			Creek Mile 2.1		River Mile 1.5		Mile 27.9		Mile 2.2		Mile 8.7	
			3LAU10015		3LAU10011		3LAU10023		3LAU10001		3LAU10014	
			Count	Density	Count	Density	Count	Density	Count	Density	Count	Density
TOTAL NO. OF ORGANISMS			5558		2344		21270		2666		50	
TOTAL NO. OF TAXA			42		50		40		31		18	
TOTAL DENSITY OF ORGANISMS M^2				12338.8		5203.7		47219		5918.5		111

*Hilsenhoff Tolerance Values used when North Carolina Tolerance Values not available.

**North Carolina Tolerance Values range from 0 for organisms
very intolerant of organic wastes to 10 for organisms very tolerant of organic wastes.

***F.F.G.- Functional Feeding Group: SH=Shredder, CG=Collector/Gatherer, FC=Filtering Collector, SC=Scrapper,

TABLE 2. SUMMARY OF RBPIII METRICS, LAUREL RIVER PROJECT, AUGUST 1997.					
METRIC	**Lynn Camp Creek Mile 2.1 3LAU10015**	**Little Laurel River Mile 1.5 3LAU10011**	**Laurel River Mile 27.9 3LAU10023**	**Laurel River Mile 2.2 3LAU10001**	**Craig Creek Mile 8.7 3LAU10014**
Taxa Richness	42	50	40	31	18
Hilsenhoff Biotic Index	6.32	5.47	5.8	6.23	3.9
Ratio of Scrapers/Filtering Collectors	0.053	0.388	0.005	0	0.85
Ratio of EPT/Chironomidae abundance	0.155	0.759	0.091	0.003	7.6
Percent Contribution of Dominant Taxon	39.20%	21.50%	66.30%	33.00%	26.00%
EPT Index	10	14	8	2	9
Shannon Diversity (H')	3.094	3.806	2.785	2.927	3.507
Pielou Evenness (J')	0.574	0.674	0.527	0.591	0.841

TABLE 3. STATISTICAL ANALYSES OF SAMPLING EFFICIENCY AND COMPARISON OF THE STATIONS USING MEAN NUMBER OF ORGANISMS, AUGUST 1997.					
STATION	**NO. OF SAMPLES**	**MEAN NO. OF ORGANISMS**	**STANDARD DEVIATION**	**STANDARD ERROR OF THE MEAN**	**PRECISION OF SAMPLING MEAN**
Lynn Camp Creek Mile 2.1 3LAU10015	5	1111.6	433.30	193.76	17.43%
Little Laurel Mile 1.5 3LAU10011	5	468.8	164.94	73.76	15.73%
Laurel River Mile27.9 3LAU10023	5	4252	4546.40	2033.21	47.82%
Laurel River Mile 2.2 3LAU10001	5	533.2	248.87	111.30	20.87%
Craig Creek Mile 8.7 3LAU10014	5	10	6.04	2.7	27.02%

Calculated F=3.49

Craig Creek	Little Laurel	Laurel River 2.2	Lynn Camp Creek	Laurel River 27.9
10	468.8	533.2	1111.6	4252

*Stations underlined are statistically comparable at a 0.05 confidence level.

TABLE 4. STATISTICAL ANALYSES OF SAMPLING EFFICIENCY AND COMPARISON OF THE STATIONS USING MEAN NUMBER OF SPECIES, AUGUST 1997.					
STATION	**NO. OF SAMPLES**	**MEAN NO. OF SPECIES**	**STANDARD DEVIATION**	**STANDARD ERROR OF THE MEAN**	**PRECISION OF SAMPLING MEAN**
Lynn Camp Creek Mile 2.1 3LAU10015	5	23.6	3.21	1.43	6.08%
Little Laurel Mile 1.5 3LAU10011	5	27.6	2.88	1.29	4.67%
Laurel River Mile27.9 3LAU10023	5	19.2	3.56	1.59	8.30%
Laurel River Mile 2.2 3LAU10001	5	14.4	2.70	1.21	8.40%
Craig Creek Mile 8.7 3LAU10014	5	4.8	2.77	1.24	25.85%

Calculated F=42.13

Craig creek	Laurel River 2.2	Laurel River 27.9	Lynn Camp Creek	Little Laurel
4.8	14.4	19.2	23.6	27.6

*Stations underlined are statistically comparable at a 0.05 confidence level.

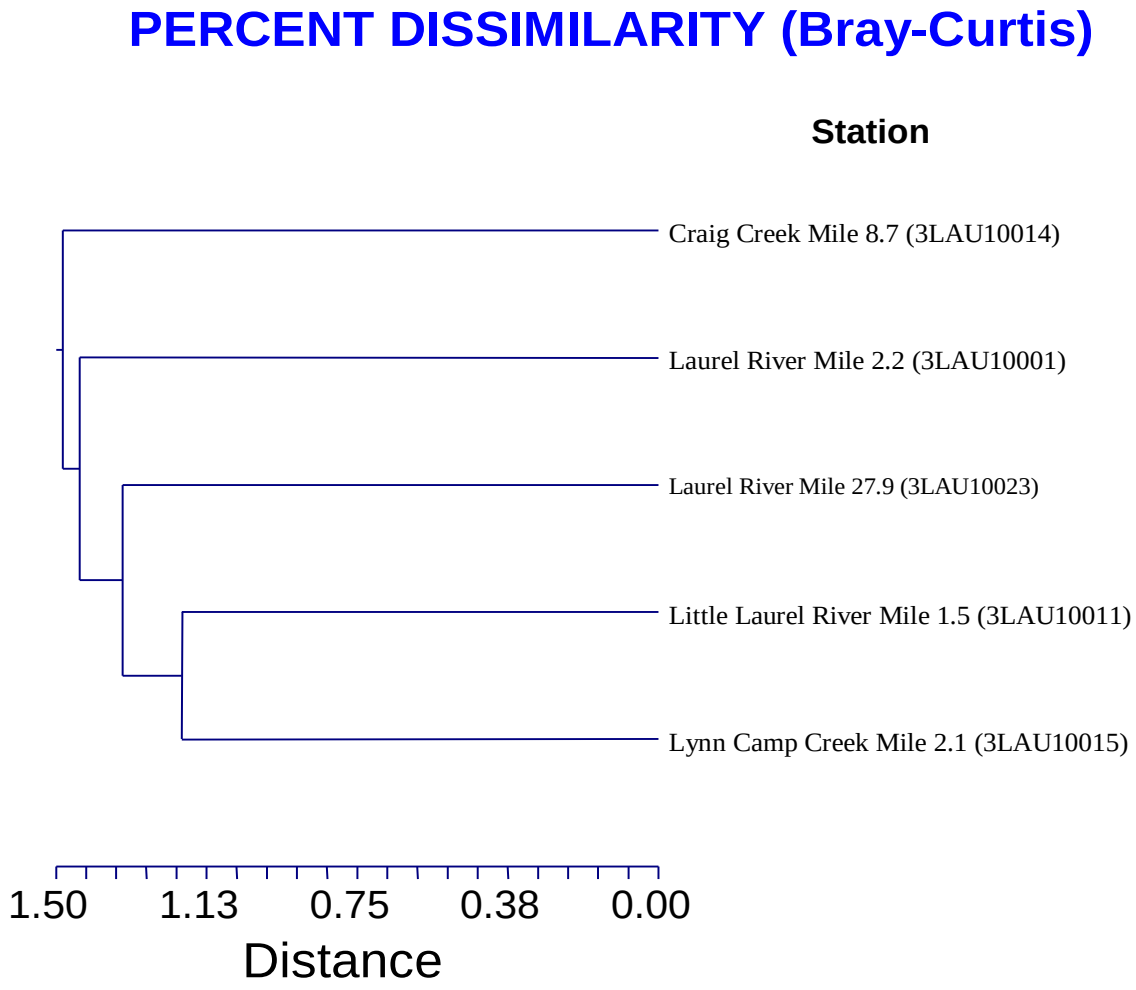

Figure 2. Percent Dissimilarity (Bray-Curtis) Cluster Analysis, Laurel River Drainage, August 1997.

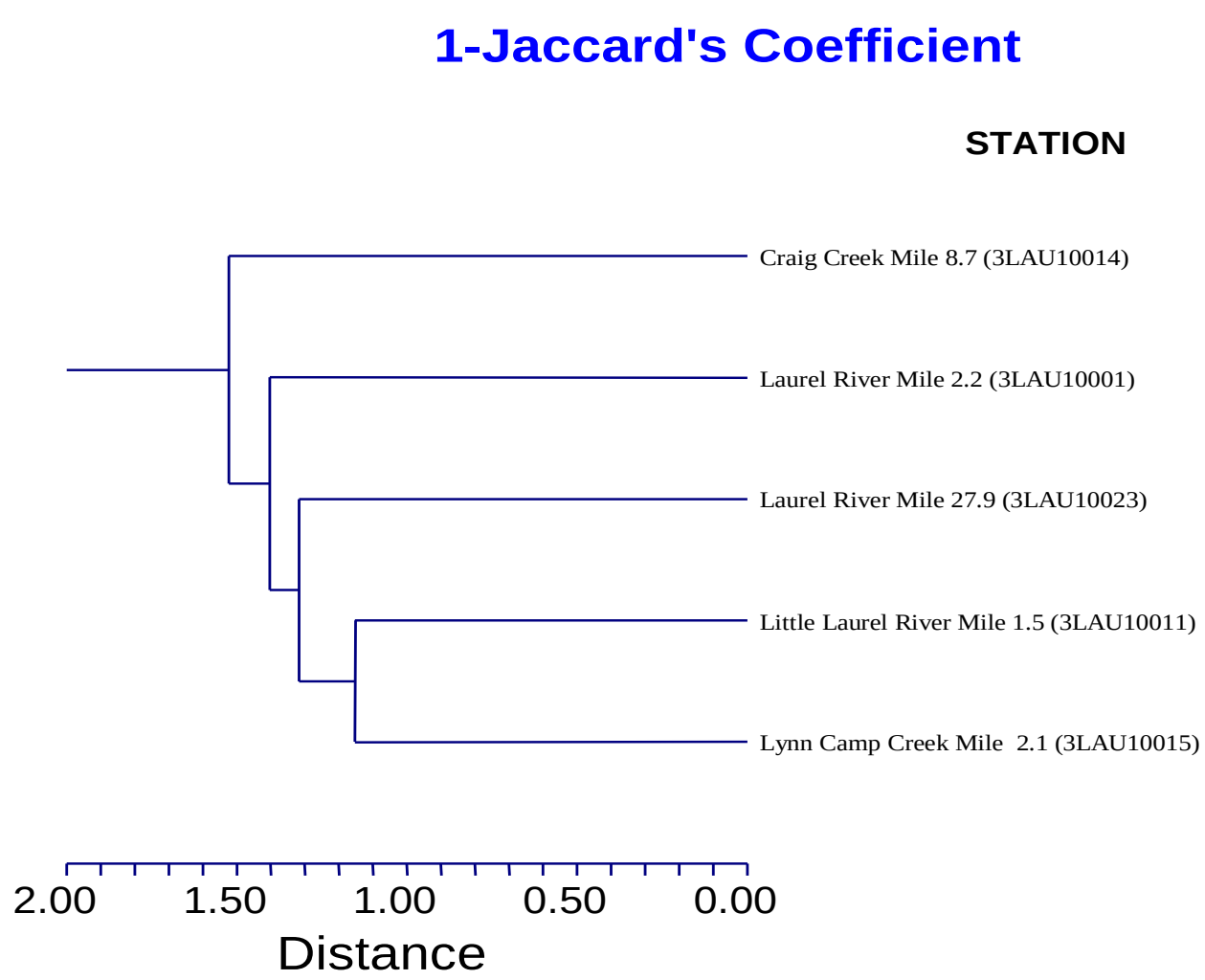

Figure 3. 1-Jaccard Coefficient Cluster Analysis, Laurel River Drainage, August, 1997.

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APPENDIX

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.

SPECIES	T.V.**	F.F.G.***	LYNN CAMP CREEK MILE 2.1 3LAU10015					
			76301-1	76301-2	76301-3	76301-4	76301-5	TOTAL
COELENTERATA								
Hydrozoa								
Hydroida								
Hydridae								
Hydra sp.	***5**	**P**						
PLATYHELMINTHES								
Turbellaria								
Tricladida								
Planariidae								
Dugesia tigrina	**7.23**	**CG**						
NEMATODA							1	1
MOLLUSCA								
Bivalvia								
Veneroida								
Corbiculidae								
Corbicula fluminea	**6.12**	**FC**	533	513	95	691	345	2177
Sphaeriidae								
Sphaerium sp.	**7.58**	**FC**						
Gastropoda								
Mesogastropoda								
Pleuroceridae								
Elimia sp.	**2.46**	**SC**		1	1	12	2	16
Basommatophora								
Ancylidae								
Ferrissia rivularis	**6.55**	**SC**	60	3	3	5	40	111
Physidae								
Physella sp.	**8.84**	**CG**		1			5	6
ANNELIDA								
Oligochaeta								
Haplotaxida								
Enchytraeidae	**9.84**	**CG**						
Lumbricidae		**CG**						
Naididae								
Nais sp.	**8.88**	**CG**						
Nais behningi	**8.89**	**CG**						
Nais bretscheri	**8.88**	**CG**						
Nais communis	**8.81**	**CG**						
Tubificidae w.o.h.c.	**7.11**	**CG**					5	5
Lumbriculida								
Lumbriculidae	**7.03**	**CG**						
Hirudinea	***8**	**P**						
ARTHROPODA								
Arachnoidea								

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.

SPECIES	T.V.**	F.F.G.***	LYNN CAMP CREEK MILE 2.1 3LAU10015					
			76301-1	76301-2	76301-3	76301-4	76301-5	TOTAL
Acariformes	**5.53**							
Hydrobatidae								
Atractides sp.	**5.53**							
Lebertiidae								
Lebertia sp.	**5.53**						5	5
Sperchonidae								
Sperchon sp.	**5.53**							
Crustacea								
Isopoda								
Asellidae								
Caecidotea sp.	**9.11**	**CG**						
Lirceus sp.	**7.85**	**CG**						
Decapoda								
Cambaridae								
Orconectes sp.	**2.6**	**SH**						
Insecta								
Ephemeroptera								
Baetidae								
Acentrella ampla	**3.61**	**CG**						
Baetis sp.	***4**	**CG**		1		1		2
Baetis intercalaris	**4.99**	**CG**	25	11	14		6	56
Caenidae								
Caenis sp.	**7.41**	**CG**		12	6	1		19
Ephemeridae								
Ephemera sp.	***3**	**CG**						
Heptageniidae								
Stenacron interpunctatum	**6.87**	**SC**						
Stenonema sp.	***4**	**SC**					1	1
Stenonema vicarium	**1.26**	**SC**						
Isonychiidae								
Isonychia sp.	**3.45**	**FC**	12	1		1		14
Tricorythidae								
Tricorythodes sp.	**5.06**	**CG**	10	10	4	11	30	65
Odonata								
Aeshnidae								
Boyeria vinosa	**5.89**	**P**						
Coenagrionidae								
Argia sp.	**8.17**	**P**	22	21	4	32	1	80
Gomphidae								
Gomphus sp.	**5.8**	**P**	1				1	2
Plecoptera								
Perlidae								
Acroneuria abnormis	**2.06**	**P**						
Megaloptera								
Corydalidae								
Corydalus cornutus	**5.16**	**P**	1		2			3

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.

SPECIES	T.V.**	F.F.G.***	LYNN CAMP CREEK					
			MILE 2.1 3LAU10015					
			76301-1	76301-2	76301-3	76301-4	76301-5	TOTAL
Nigronia sp.	**4.95**	**P**						
Nigronia serricornis	**4.95**	**P**		1			1	2
Trichoptera								
Helicopsychidae								
Helicopsyche borealis	**0**	**SC**		1				1
Hydropsychidae				1	2			3
Cheumatopsyche sp.	**6.22**	**FC**	65	51	62	13	26	217
Ceratopsyche sp.	***4**	**FC**						
Ceratopsyche morosa	***6**	**FC**						
Hydropsyche sp.	**6.22**	**FC**						
Hydropsyche betteni gp.	**7.78**	**FC**						
Hydroptilidae								
Hydroptila sp.	**6.22**	**PI**	10	1	1		16	28
Limnephilidae								
Pycnopsyche sp.	**2.52**	**SH**						
Philopotamidae								
Chimarra sp.	**2.76**	**FC**						
Polycentropodidae								
Polycentropus sp.	**3.53**	**FC**						
Coleoptera								
Dryopidae								
Helichus basalis	**4.63**	**CG**						
Elmidae								
Ancyronyx variegata	**6.49**	**SC**						
Optioservus sp.	**2.36**	**SC**						
Stenelmis sp.	**5.1**	**SC**	20					20
Hydrophilidae								
Berosus sp.	**8.43**	**CG**		2	6		5	13
Psephenidae								
Psephenus herricki	**2.35**	**SC**	1					1
Diptera								
Ceratopogonidae								
Atrichopogon sp.	**6.49**				1			1
Chironomidae			80	20	22	50	51	223
Ablabesmyia mallochi	**7.19**	**P**						
Ablabesmyia parajanta	**7.37**	**P**						
Cardiocladius obscurus	**5.87**	**P**						
Conchapelopia sp.	**8.42**	**P**	6	13	85	110	330	544
Cricotopus sp.	***7**	**CG**						
Cricotopus bicinctus	**8.54**	**CG**	2	8	42	10	50	112
Cricotopus tremulus	***7**	**CG**	1	1		10		12
Cricotopus trifascia	**2.84**	**SH**						
Cryptochironomus fulvus	**6.38**	**P**			3			3
Dicrotendipes sp.	**8.1**	**CG**	8	17	62	90	230	407
Eukiefferiella claripennis gp.	**5.58**	**CG**						
Eukiefferiella devonica gp.	**2.59**	**CG**						

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.

SPECIES	T.V.**	F.F.G.***	LYNN CAMP CREEK					
			MILE 2.1 3LAU10015					
			76301-1	76301-2	76301-3	76301-4	76301-5	TOTAL
Glyptotendipes sp.	**9.47**	**FC**						
Microtendipes sp.	**5.53**	**CG**						
Nanocladius sp.	**7.07**	**CG**						
Nilothauma sp.	**3.9**	**CG**						
Orthocladius sp.	***4**	**CG**	1					1
Orthocladius (Euorthocladius sp.)	***6**	**CG**						
Parachironomus sp.	**9.42**	**CG**						
Parakiefferiella sp.	**5.4**	**CG**	1					1
Parakiefferiella bathophila	**5.4**	**CG**					10	10
Parametriocnemus lundbecki	**3.65**	**CG**						
Phaenopsectra sp.	**6.5**							
Polypedilum sp.	***7**	**SH**						
Polypedilum convictum	**4.93**	**SH**	63	20	195	310	360	948
Polypedilum halterale	**7.31**	**SH**	3				30	33
Polypedilum illinoense	**9**	**SH**						
Pseudochironomus sp.	**5.36**							
Rheocricotopus sp.	**7.3**	**CG**						
Rheocricotopus robacki	**7.28**	**CG**						
Rheotanytarsus sp.	**5.89**	**FC**	25	9	65	140	30	269
Tanytarsus sp.	**6.76**	**FC**		1	3	10	40	54
Thienemanniella xena	**5.86**	**CG**	1	3	3			7
Thienemannimyia gp.	**8.42**	**P**						
Tvetenia bavarica gp.	**3.65**	**CG**						
Zavrelia sp.	**5.3**	**CG**	1					1
Empididae								
Chelifera sp.	***6**	**P**						
Hemerodromia sp.	**7.57**	**P**			1			1
Muscidae	***8**	**P**						
Simuliidae								
Simulium sp.	**4**	**FC**	80		1	1	1	83
Tipulidae								
Antocha sp.	**4.25**	**CG**						
Tipula sp.	**7.33**	**SH**						
TOTAL NO. OF ORGANISMS			**1032**	**723**	**683**	**1498**	**1622**	**5558**
TOTAL NO. OF TAXA			**25**	**25**	**24**	**18**	**26**	**42**

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.								
SPECIES	**T.V.****	**F.F.G.*****	**LITTLE LAUREL RIVER**					
			MILE1.5 3LAU10011					
			094037-1	**094037-2**	**094037-3**	**094037-4**	**094037-5**	**TOTAL**
COELENTERATA								
Hydrozoa								
Hydroida								
Hydridae								
Hydra sp.	***5**	**P**						
PLATYHELMINTHES								
Turbellaria								
Tricladida								
Planariidae								
Dugesia tigrina	**7.23**	**CG**						
NEMATODA			4	3		3	1	11
MOLLUSCA								
Bivalvia								
Veneroida								
Corbiculidae								
Corbicula fluminea	**6.12**	**FC**	1	5	1		5	12
Sphaeriidae								
Sphaerium sp.	**7.58**	**FC**						
Gastropoda								
Mesogastropoda								
Pleuroceridae								
Elimia sp.	**2.46**	**SC**				1	2	3
Basommatophora								
Ancylidae								
Ferrissia rivularis	**6.55**	**SC**						
Physidae								
Physella sp.	**8.84**	**CG**	1					1
ANNELIDA								
Oligochaeta								
Haplotaxida								
Enchytraeidae	**9.84**	**CG**						
Lumbricidae		**CG**				3		3
Naididae								
Nais sp.	**8.88**	**CG**						
Nais behningi	**8.89**	**CG**						
Nais bretscheri	**8.88**	**CG**						
Nais communis	**8.81**	**CG**						
Tubificidae w.o.h.c.	**7.11**	**CG**	7	1				8
Lumbriculida								
Lumbriculidae	**7.03**	**CG**						
Hirudinea	***8**	**P**						
ARTHROPODA								
Arachnoidea								
Acariformes	**5.53**					3		3
Hydrobatidae								
Atractides sp.	**5.53**			2			2	4
Lebertiidae								

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.								
SPECIES	**T.V.****	**F.F.G.*****	**LITTLE LAUREL RIVER**					
			MILE1.5 3LAU10011					
			094037-1	**094037-2**	**094037-3**	**094037-4**	**094037-5**	**TOTAL**
Lebertia sp.	**5.53**							
Sperchonidae								
Sperchon sp.	**5.53**					3	1	4
Crustacea								
Isopoda								
Asellidae								
Caecidotea sp.	**9.11**	**CG**						
Lirceus sp.	**7.85**	**CG**					1	1
Decapoda								
Cambaridae								
Orconectes sp.	**2.6**	**SH**					1	1
Insecta								
Ephemeroptera								
Baetidae								
Acentrella ampla	**3.61**	**CG**						
Baetis sp.	***4**	**CG**						
Baetis intercalaris	**4.99**	**CG**	3	3	5	3	8	22
Caenidae								
Caenis sp.	**7.41**	**CG**			1	3	2	6
Ephemeridae				6				6
Ephemera sp.	***3**	**CG**			1	3	2	6
Heptageniidae								
Stenacron interpunctatum	**6.87**	**SC**		1				1
Stenonema sp.	***4**	**SC**	44	103	35	111	84	377
Stenonema vicarium	**1.26**	**SC**						
Isonychiidae								
Isonychia sp.	**3.45**	**FC**	1		8	4	7	20
Tricorythidae								
Tricorythodes sp.	**5.06**	**CG**						
Odonata								
Aeshnidae								
Boyeria vinosa	**5.89**	**P**						
Coenagrionidae								
Argia sp.	**8.17**	**P**						
Gomphidae								
Gomphus sp.	**5.8**	**P**						
Plecoptera								
Perlidae								
Acroneuria abnormis	**2.06**	**P**						
Megaloptera								
Corydalidae								
Corydalus cornutus	**5.16**	**P**	12	8	28	30	38	116
Nigronia sp.	**4.95**	**P**				3		3
Nigronia serricornis	**4.95**	**P**	2	1	2	3	1	9
Trichoptera								
Helicopsychidae								
Helicopsyche borealis	**0**	**SC**						

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.								
SPECIES	**T.V.****	**F.F.G.*****	**LITTLE LAUREL RIVER**					
			MILE1.5 3LAU10011					
			094037-1	**094037-2**	**094037-3**	**094037-4**	**094037-5**	**TOTAL**
Hydropsychidae				2		33		35
Cheumatopsyche sp.	**6.22**	**FC**	55	25	60	76	136	352
Ceratopsyche sp.	***4**	**FC**				3		3
Ceratopsyche morosa	***6**	**FC**					1	1
Hydropsyche sp.	**6.22**	**FC**			4	27		31
Hydropsyche betteni gp.	**7.78**	**FC**						
Hydroptilidae							3	3
Hydroptila sp.	**6.22**	**PI**		1	2	3	1	7
Limnephilidae								
Pycnopsyche sp.	**2.52**	**SH**						
Philopotamidae								
Chimarra sp.	**2.76**	**FC**						
Polycentropodidae								
Polycentropus sp.	**3.53**	**FC**						
Coleoptera								
Dryopidae								
Helichus basalis	**4.63**	**CG**						
Elmidae								
Ancyronyx variegata	**6.49**	**SC**						
Optioservus sp.	**2.36**	**SC**						
Stenelmis sp.	**5.1**	**SC**						
Hydrophilidae								
Berosus sp.	**8.43**	**CG**						
Psephenidae								
Psephenus herricki	**2.35**	**SC**						
Diptera								
Ceratopogonidae								
Atrichopogon sp.	**6.49**							
Chironomidae			8	13	16	20	14	71
Ablabesmyia mallochi	**7.19**	**P**	3		1			4
Ablabesmyia parajanta	**7.37**	**P**						
Cardiocladius obscurus	**5.87**	**P**				7		7
Conchapelopia sp.	**8.42**	**P**	7	7	8	3		25
Cricotopus sp.	***7**	**CG**					14	14
Cricotopus bicinctus	**8.54**	**CG**						
Cricotopus tremulus	***7**	**CG**	3	7	1	7		18
Cricotopus trifascia	**2.84**	**SH**						
Cryptochironomus fulvus	**6.38**	**P**						
Dicrotendipes sp.	**8.1**	**CG**	1	2	1	3		7
Eukiefferiella claripennis gp.	**5.58**	**CG**						
Eukiefferiella devonica gp.	**2.59**	**CG**						
Glyptotendipes sp.	**9.47**	**FC**						
Microtendipes sp.	**5.53**	**CG**	79	19	11	43	27	179
Nanocladius sp.	**7.07**	**CG**						
Nilothauma sp.	**3.9**	**CG**						
Orthocladius sp.	***4**	**CG**						

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.								
SPECIES	**T.V.****	**F.F.G.*****	**LITTLE LAUREL RIVER**					
			MILE1.5 3LAU10011					
			094037-1	**094037-2**	**094037-3**	**094037-4**	**094037-5**	**TOTAL**
Orthocladius (Euorthocladius sp.)	***6**	**CG**						
Parachironomus sp.	**9.42**	**CG**						
Parakiefferiella sp.	**5.4**	**CG**						
Parakiefferiella bathophila	**5.4**	**CG**						
Parametriocnemus lundbecki	**3.65**	**CG**		1	1	7	3	12
Phaenopsectra sp.	**6.5**		1			3	3	7
Polypedilum sp.	***7**	**SH**						
Polypedilum convictum	**4.93**	**SH**	38	11		70	70	189
Polypedilum halterale	**7.31**	**SH**	6	1	3		3	13
Polypedilum illinoense	**9**	**SH**			27			27
Pseudochironomus sp.	**5.36**							
Rheocricotopus sp.	**7.3**	**CG**			1			1
Rheocricotopus robacki	**7.28**	**CG**	6	1				7
Rheotanytarsus sp.	**5.89**	**FC**	94	59	93	137	122	505
Tanytarsus sp.	**6.76**	**FC**	13	4	4	17	14	52
Thienemanniella xena	**5.86**	**CG**						
Thienemannimyia gp.	**8.42**	**P**					8	8
Tvetenia bavarica gp.	**3.65**	**CG**						
Zavrelia sp.	**5.3**	**CG**						
Empididae				1	4		4	9
Chelifera sp.	***6**	**P**						
Hemerodromia sp.	**7.57**	**P**		5	3			8
Muscidae	***8**	**P**						
Simuliidae								
Simulium sp.	**4**	**FC**	1				5	6
Tipulidae								
Antocha sp.	**4.25**	**CG**	24	7	24	33	38	126
Tipula sp.	**7.33**	**SH**						
TOTAL NO. OF ORGANISMS			**414**	**299**	**345**	**665**	**621**	**2344**
TOTAL NO. OF TAXA			**24**	**27**	**26**	**30**	**31**	**50**

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.								
SPECIES	**T.V.****	**F.F.G.*****	**LAUREL RIVER**					
			MILE 27.9 3LAU10023					
			094039-1	**094039-2**	**094039-3**	**094039-4**	**094039-5**	**TOTAL**
COELENTERATA								
Hydrozoa								
Hydroida								
Hydridae								
Hydra sp.	***5**	**P**	20			10		30
PLATYHELMINTHES								
Turbellaria								
Tricladida								
Planariidae								
Dugesia tigrina	**7.23**	**CG**		10				10
NEMATODA								
MOLLUSCA								
Bivalvia								
Veneroida								
Corbiculidae								
Corbicula fluminea	**6.12**	**FC**	2	32	16	38	32	120
Sphaeriidae								
Sphaerium sp.	**7.58**	**FC**	10					10
Gastropoda								
Mesogastropoda								
Pleuroceridae								
Elimia sp.	**2.46**	**SC**						
Basommatophora								
Ancylidae								
Ferrissia rivularis	**6.55**	**SC**						
Physidae								
Physella sp.	**8.84**	**CG**						
ANNELIDA								
Oligochaeta								
Haplotaxida								
Enchytraeidae	**9.84**	**CG**						
Lumbricidae		**CG**						
Naididae								
Nais sp.	**8.88**	**CG**						
Nais behningi	**8.89**	**CG**			10			10
Nais bretscheri	**8.88**	**CG**	1					1
Nais communis	**8.81**	**CG**	1					1
Tubificidae w.o.h.c.	**7.11**	**CG**						
Lumbriculida								
Lumbriculidae	**7.03**	**CG**						
Hirudinea	***8**	**P**			10			10
ARTHROPODA								
Arachnoidea								
Acariformes	**5.53**							
Hydrobatidae								
Atractides sp.	**5.53**		10					10
Lebertiidae								

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.								
SPECIES	**T.V.****	**F.F.G.*****	**LAUREL RIVER**					
			MILE 27.9 3LAU10023					
			094039-1	**094039-2**	**094039-3**	**094039-4**	**094039-5**	**TOTAL**
Lebertia sp.	**5.53**							
Sperchonidae								
Sperchon sp.	**5.53**			6				6
Crustacea								
Isopoda								
Asellidae								
Caecidotea sp.	**9.11**	**CG**						
Lirceus sp.	**7.85**	**CG**						
Decapoda								
Cambaridae								
Orconectes sp.	**2.6**	**SH**						
Insecta								
Ephemeroptera								
Baetidae								
Acentrella ampla	**3.61**	**CG**						
Baetis sp.	***4**	**CG**			10			10
Baetis intercalaris	**4.99**	**CG**						
Caenidae								
Caenis sp.	**7.41**	**CG**						
Ephemeridae								
Ephemera sp.	***3**	**CG**						
Heptageniidae								
Stenacron interpunctatum	**6.87**	**SC**			2		6	8
Stenonema sp.	***4**	**SC**	20	1	10	5	12	48
Stenonema vicarium	**1.26**	**SC**						
Isonychiidae								
Isonychia sp.	**3.45**	**FC**	10		1	1	1	13
Tricorythidae								
Tricorythodes sp.	**5.06**	**CG**						
Odonata								
Aeshnidae								
Boyeria vinosa	**5.89**	**P**						
Coenagrionidae								
Argia sp.	**8.17**	**P**						
Gomphidae								
Gomphus sp.	**5.8**	**P**						
Plecoptera								
Perlidae								
Acroneuria abnormis	**2.06**	**P**						
Megaloptera								
Corydalidae								
Corydalus cornutus	**5.16**	**P**	3	2	1	12	8	26
Nigronia sp.	**4.95**	**P**						
Nigronia serricornis	**4.95**	**P**						
Trichoptera								
Helicopsychidae								
Helicopsyche borealis	**0**	**SC**						

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.								
SPECIES	**T.V.****	**F.F.G.*****	**LAUREL RIVER**					
			MILE 27.9 3LAU10023					
			094039-1	**094039-2**	**094039-3**	**094039-4**	**094039-5**	**TOTAL**
Hydropsychidae			75	1	90			166
Cheumatopsyche sp.	**6.22**	**FC**	212	752	122	84	111	1281
Ceratopsyche sp.	***4**	**FC**						
Ceratopsyche morosa	***6**	**FC**						
Hydropsyche sp.	**6.22**	**FC**			30			30
Hydropsyche betteni gp.	**7.78**	**FC**	23	85	2	4	26	140
Hydroptilidae								
Hydroptila sp.	**6.22**	**PI**						
Limnephilidae								
Pycnopsyche sp.	**2.52**	**SH**						
Philopotamidae								
Chimarra sp.	**2.76**	**FC**						
Polycentropodidae								
Polycentropus sp.	**3.53**	**FC**						
Coleoptera								
Dryopidae								
Helichus basalis	**4.63**	**CG**						
Elmidae								
Ancyronyx variegata	**6.49**	**SC**		10				10
Optioservus sp.	**2.36**	**SC**		10		10		20
Stenelmis sp.	**5.1**	**SC**						
Hydrophilidae								
Berosus sp.	**8.43**	**CG**						
Psephenidae								
Psephenus herricki	**2.35**	**SC**						
Diptera								
Ceratopogonidae								
Atrichopogon sp.	**6.49**							
Chironomidae			95	270	121	170	45	701
Ablabesmyia mallochi	**7.19**	**P**						
Ablabesmyia parajanta	**7.37**	**P**			20			20
Cardiocladius obscurus	**5.87**	**P**	4	40	20			64
Conchapelopia sp.	**8.42**	**P**	6			30	20	56
Cricotopus sp.	***7**	**CG**			20	10		30
Cricotopus bicinctus	**8.54**	**CG**						
Cricotopus tremulus	***7**	**CG**						
Cricotopus trifascia	**2.84**	**SH**						
Cryptochironomus fulvus	**6.38**	**P**						
Dicrotendipes sp.	**8.1**	**CG**	3	40			10	53
Eukiefferiella claripennis gp.	**5.58**	**CG**						
Eukiefferiella devonica gp.	**2.59**	**CG**						
Glyptotendipes sp.	**9.47**	**FC**		40				40
Microtendipes sp.	**5.53**	**CG**						
Nanocladius sp.	**7.07**	**CG**				10		10
Nilothauma sp.	**3.9**	**CG**	3					3
Orthocladius sp.	***4**	**CG**						

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.								
SPECIES	**T.V.****	**F.F.G.*****	**LAUREL RIVER**					
			MILE 27.9 3LAU10023					
			094039-1	**094039-2**	**094039-3**	**094039-4**	**094039-5**	**TOTAL**
Orthocladius (Euorthocladius sp.)	***6**	**CG**	3					3
Parachironomus sp.	**9.42**	**CG**	9	40	110	30		189
Parakiefferiella sp.	**5.4**	**CG**						
Parakiefferiella bathophila	**5.4**	**CG**						
Parametriocnemus lundbecki	**3.65**	**CG**						
Phaenopsectra sp.	**6.5**							
Polypedilum sp.	***7**	**SH**						
Polypedilum convictum	**4.93**	**SH**	106	2120	590	390	190	3396
Polypedilum halterale	**7.31**	**SH**						
Polypedilum illinoense	**9**	**SH**						
Pseudochironomus sp.	**5.36**							
Rheocricotopus sp.	**7.3**	**CG**						
Rheocricotopus robacki	**7.28**	**CG**						
Rheotanytarsus sp.	**5.89**	**FC**	414	8380	2990	1740	570	14094
Tanytarsus sp.	**6.76**	**FC**						
Thienemanniella xena	**5.86**	**CG**						
Thienemannimyia gp.	**8.42**	**P**						
Tvetenia bavarica gp.	**3.65**	**CG**						
Zavrelia sp.	**5.3**	**CG**						
Empididae				20				20
Chelifera sp.	***6**	**P**						
Hemerodromia sp.	**7.57**	**P**	60	120	40		30	250
Muscidae	***8**	**P**						
Simuliidae					10			10
Simulium sp.	**4**	**FC**	160	70	81	30	15	356
Tipulidae								
Antocha sp.	**4.25**	**CG**					5	5
Tipula sp.	**7.33**	**SH**		10				10
TOTAL NO. OF ORGANISMS			**1250**	**12059**	**4306**	**2574**	**1081**	**21270**
TOTAL NO. OF TAXA			**23**	**21**	**22**	**16**	**15**	**40**

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.								
SPECIES	**T.V.****	**F.F.G.*****	**LAUREL RIVER**					
			MILE 2.2 3LAU10001					
			76302-1	**76302-2**	**76302-3**	**76302-4**	**76302-5**	**TOTAL**
COELENTERATA								
Hydrozoa								
Hydroida								
Hydridae								
Hydra sp.	***5**	**P**			30	20	1	51
PLATYHELMINTHES								
Turbellaria								
Tricladida								
Planariidae								
Dugesia tigrina	**7.23**	**CG**						
NEMATODA								
MOLLUSCA								
Bivalvia								
Veneroida								
Corbiculidae								
Corbicula fluminea	**6.12**	**FC**						
Sphaeriidae								
Sphaerium sp.	**7.58**	**FC**						
Gastropoda								
Mesogastropoda								
Pleuroceridae								
Elimia sp.	**2.46**	**SC**						
Basommatophora								
Ancylidae								
Ferrissia rivularis	**6.55**	**SC**						
Physidae								
Physella sp.	**8.84**	**CG**						
ANNELIDA								
Oligochaeta								
Haplotaxida								
Enchytraeidae	**9.84**	**CG**	10		51	22	5	88
Lumbricidae		**cg**						
Naididae								
Nais sp.	**8.88**	**CG**			25	11	1	37
Nais behningi	**8.89**	**CG**						
Nais bretscheri	**8.88**	**CG**	10	185	433	190	1	819
Nais communis	**8.81**	**CG**		53			18	71
Tubificidae w.o.h.c.	**7.11**	**CG**						
Lumbriculida								
Lumbriculidae	**7.03**	**CG**		27				27
Hirudinea	***8**	**P**						
ARTHROPODA								
Arachnoidea								
Acariformes	**5.53**							
Hydrobatidae								
Atractides sp.	**5.53**							
Lebertiidae								

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.

SPECIES	T.V.**	F.F.G.***	LAUREL RIVER					
			MILE 2.2 3LAU10001					
			76302-1	76302-2	76302-3	76302-4	76302-5	TOTAL
Lebertia sp.	**5.53**							
Sperchonidae								
Sperchon sp.	**5.53**							
Crustacea								
Isopoda								
Asellidae								
Caecidotea sp.	**9.11**	**CG**		5	15	7	2	29
Lirceus sp.	**7.85**	**CG**						
Decapoda								
Cambaridae								
Orconectes sp.	**2.6**	**SH**						
Insecta								
Ephemeroptera								
Baetidae								
Acentrella ampla	**3.61**	**CG**						
Baetis sp.	***4**	**CG**						
Baetis intercalaris	**4.99**	**CG**						
Caenidae								
Caenis sp.	**7.41**	**CG**						
Ephemeridae								
Ephemera sp.	***3**	**CG**						
Heptageniidae								
Stenacron interpunctatum	**6.87**	**SC**						
Stenonema sp.	***4**	**SC**						
Stenonema vicarium	**1.26**	**SC**						
Isonychiidae								
Isonychia sp.	**3.45**	**FC**						
Tricorythidae								
Tricorythodes sp.	**5.06**	**CG**						
Odonata								
Aeshnidae								
Boyeria vinosa	**5.89**	**P**						
Coenagrionidae								
Argia sp.	**8.17**	**P**						
Gomphidae								
Gomphus sp.	**5.8**	**P**						
Plecoptera								
Perlidae								
Acroneuria abnormis	**2.06**	**P**						
Megaloptera								
Corydalidae								
Corydalus cornutus	**5.16**	**P**						
Nigronia sp.	**4.95**	**P**						
Nigronia serricornis	**4.95**	**P**						
Trichoptera								
Helicopsychidae								
Helicopsyche borealis	**0**	**SC**						

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.

SPECIES	T.V.**	F.F.G.***	LAUREL RIVER					
			MILE 2.2 3LAU10001					
			76302-1	76302-2	76302-3	76302-4	76302-5	TOTAL
Hydropsychidae								
Cheumatopsyche sp.	**6.22**	**FC**	3					3
Ceratopsyche sp.	***4**	**FC**						
Ceratopsyche morosa	***6**	**FC**						
Hydropsyche sp.	**6.22**	**FC**					1	1
Hydropsyche betteni gp.	**7.78**	**FC**						
Hydroptilidae								
Hydroptila sp.	**6.22**	**PI**						
Limnephilidae								
Pycnopsyche sp.	**2.52**	**SH**						
Philopotamidae								
Chimarra sp.	**2.76**	**FC**						
Polycentropodidae								
Polycentropus sp.	**3.53**	**FC**						
Coleoptera								
Dryopidae								
Helichus basalis	**4.63**	**CG**						
Elmidae								
Ancyronyx variegata	**6.49**	**SC**						
Optioservus sp.	**2.36**	**SC**						
Stenelmis sp.	**5.1**	**SC**						
Hydrophilidae								
Berosus sp.	**8.43**	**CG**						
Psephenidae								
Psephenus herricki	**2.35**	**SC**						
Diptera								
Ceratopogonidae								
Atrichopogon sp.	**6.49**				1			1
Chironomidae			10	30	40	20	2	102
Ablabesmyia mallochi	**7.19**	**P**						
Ablabesmyia parajanta	**7.37**	**P**						
Cardiocladius obscurus	**5.87**	**P**						
Conchapelopia sp.	**8.42**	**P**					7	7
Cricotopus sp.	***7**	**CG**	21			50	2	73
Cricotopus bicinctus	**8.54**	**CG**	30	55	8	30	10	133
Cricotopus tremulus	***7**	**CG**	43	100	13	13	49	218
Cricotopus trifascia	**2.84**	**SH**	4		1			5
Cryptochironomus fulvus	**6.38**	**P**						
Dicrotendipes sp.	**8.1**	**CG**				3		3
Eukiefferiella claripennis gp.	**5.58**	**CG**	8					8
Eukiefferiella devonica gp.	**2.59**	**CG**	269	375	52	100	84	880
Glyptotendipes sp.	**9.47**	**FC**						
Microtendipes sp.	**5.53**	**CG**						
Nanocladius sp.	**7.07**	**CG**						
Nilothauma sp.	**3.9**	**CG**						
Orthocladius sp.	***4**	**CG**	4	15	4		5	28

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.								
SPECIES	**T.V.****	**F.F.G.*****	**LAUREL RIVER**					
			MILE 2.2 3LAU10001					
			76302-1	**76302-2**	**76302-3**	**76302-4**	**76302-5**	**TOTAL**
Orthocladius (Euorthocladius sp.)	***6**	**CG**					2	2
Parachironomus sp.	**9.42**	**CG**						
Parakiefferiella sp.	**5.4**	**CG**						
Parakiefferiella bathophila	**5.4**	**CG**						
Parametriocnemus lundbecki	**3.65**	**CG**	4		1		5	10
Phaenopsectra sp.	**6.5**					23		23
Polypedilum sp.	***7**	**SH**				3		3
Polypedilum convictum	**4.93**	**SH**	4					4
Polypedilum halterale	**7.31**	**SH**						
Polypedilum illinoense	**9**	**SH**						
Pseudochironomus sp.	**5.36**				3			3
Rheocricotopus sp.	**7.3**	**CG**						
Rheocricotopus robacki	**7.28**	**CG**						
Rheotanytarsus sp.	**5.89**	**FC**	8	10	1			19
Tanytarsus sp.	**6.76**	**FC**						
Thienemanniella xena	**5.86**	**CG**						
Thienemannimyia gp.	**8.42**	**P**						
Tvetenia bavarica gp.	**3.65**	**CG**					2	2
Zavrelia sp.	**5.3**	**CG**						
Empididae								
Chelifera sp.	***6**	**P**	1					1
Hemerodromia sp.	**7.57**	**P**						
Muscidae	***8**	**P**				5		5
Simuliidae								
Simulium sp.	**4**	**FC**	10					10
Tipulidae								
Antocha sp.	**4.25**	**CG**						
Tipula sp.	**7.33**	**SH**						
TOTAL NO. OF ORGANISMS			**439**	**855**	**678**	**497**	**197**	**2666**
TOTAL NO. OF TAXA			**16**	**10**	**15**	**14**	**17**	**31**

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.								
SPECIES	**T.V.****	**F.F.G.*****	**CRAIG CREEK**					
			MILE 8.7 3ALU10014					
			76303-1	**76303-2**	**76303-3**	**76303-4**	**76303-5**	**TOTAL**
COELENTERATA								
Hydrozoa								
Hydroida								
Hydridae								
Hydra sp.	***5**	**P**						
PLATYHELMINTHES								
Turbellaria								
Tricladida								
Planariidae								
Dugesia tigrina	**7.23**	**CG**						
NEMATODA								
MOLLUSCA								
Bivalvia								
Veneroida								
Corbiculidae								
Corbicula fluminea	**6.12**	**FC**						
Sphaeriidae								
Sphaerium sp.	**7.58**	**FC**	1					1
Gastropoda								
Mesogastropoda								
Pleuroceridae								
Elimia sp.	**2.46**	**SC**		1				1
Basommatophora								
Ancylidae								
Ferrissia rivularis	**6.55**	**SC**						
Physidae								
Physella sp.	**8.84**	**CG**						
ANNELIDA								
Oligochaeta								
Haplotaxida								
Enchytraeidae	**9.84**	**CG**						
Lumbricidae		**CG**						
Naididae								
Nais sp.	**8.88**	**CG**						
Nais behningi	**8.89**	**CG**						
Nais bretscheri	**8.88**	**CG**						
Nais communis	**8.81**	**CG**						
Tubificidae w.o.h.c.	**7.11**	**CG**						
Lumbriculida								
Lumbriculidae	**7.03**	**CG**						
Hirudinea	***8**	**P**						
ARTHROPODA								
Arachnoidea								
Acariformes	**5.53**							
Hydrobatidae								
Atractides sp.	**5.53**							
Lebertiidae								

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.

SPECIES	T.V.**	F.F.G.***	CRAIG CREEK					
			MILE 8.7 3ALU10014					
			76303-1	76303-2	76303-3	76303-4	76303-5	TOTAL
Lebertia sp.	**5.53**							
Sperchonidae								
Sperchon sp.	**5.53**							
Crustacea								
Isopoda								
Asellidae								
Caecidotea sp.	**9.11**	**CG**						
Lirceus sp.	**7.85**	**CG**						
Decapoda								
Cambaridae								
Orconectes sp.	**2.6**	**SH**						
Insecta								
Ephemeroptera								
Baetidae								
Acentrella ampla	**3.61**	**CG**	1					1
Baetis sp.	***4**	**CG**						
Baetis intercalaris	**4.99**	**CG**						
Caenidae								
Caenis sp.	**7.41**	**CG**						
Ephemeridae								
Ephemera sp.	***3**	**CG**						
Heptageniidae								
Stenacron interpunctatum	**6.87**	**SC**						
Stenonema sp.	***4**	**SC**				3		3
Stenonema vicarium	**1.26**	**SC**	5	6	2			13
Isonychiidae								
Isonychia sp.	**3.45**	**FC**		4				4
Tricorythidae								
Tricorythodes sp.	**5.06**	**CG**						
Odonata								
Aeshnidae								
Boyeria vinosa	**5.89**	**P**	1					1
Coenagrionidae								
Argia sp.	**8.17**	**P**						
Gomphidae								
Gomphus sp.	**5.8**	**P**						
Plecoptera								
Perlidae								
Acroneuria abnormis	**2.06**	**P**	1					1
Megaloptera								
Corydalidae								
Corydalus cornutus	**5.16**	**P**						
Nigronia sp.	**4.95**	**P**						
Nigronia serricornis	**4.95**	**P**				1		1
Trichoptera								
Helicopsychidae								
Helicopsyche borealis	**0**	**SC**						

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.

SPECIES	T.V.**	F.F.G.***	CRAIG CREEK					
			MILE 8.7 3ALU10014					
			76303-1	76303-2	76303-3	76303-4	76303-5	TOTAL
Hydropsychidae								
Cheumatopsyche sp.	**6.22**	**FC**			1	1		2
Ceratopsyche sp.	***4**	**FC**						
Ceratopsyche morosa	***6**	**FC**						
Hydropsyche sp.	**6.22**	**FC**						
Hydropsyche betteni gp.	**7.78**	**FC**						
Hydroptilidae								
Hydroptila sp.	**6.22**	**PI**						
Limnephilidae								
Pycnopsyche sp.	**2.52**	**SH**					3	3
Philopotamidae								
Chimarra sp.	**2.76**	**FC**	1	4	5			10
Polycentropodidae								
Polycentropus sp.	**3.53**	**FC**	1					1
Coleoptera								
Dryopidae								
Helichus basalis	**4.63**	**CG**	1					1
Elmidae								
Ancyronyx variegata	**6.49**	**SC**						
Optioservus sp.	**2.36**	**SC**						
Stenelmis sp.	**5.1**	**SC**						
Hydrophilidae								
Berosus sp.	**8.43**	**CG**						
Psephenidae								
Psephenus herricki	**2.35**	**SC**						
Diptera								
Ceratopogonidae								
Atrichopogon sp.	**6.49**							
Chironomidae								
Ablabesmyia mallochi	**7.19**	**P**						
Ablabesmyia parajanta	**7.37**	**P**						
Cardiocladius obscurus	**5.87**	**P**						
Conchapelopia sp.	**8.42**	**P**						
Cricotopus sp.	***7**	**CG**						
Cricotopus bicinctus	**8.54**	**CG**						
Cricotopus tremulus	***7**	**CG**						
Cricotopus trifascia	**2.84**	**SH**						
Cryptochironomus fulvus	**6.38**	**P**						
Dicrotendipes sp.	**8.1**	**CG**						
Eukiefferiella claripennis gp.	**5.58**	**CG**						
Eukiefferiella devonica gp.	**2.59**	**CG**			1			1
Glyptotendipes sp.	**9.47**	**FC**						
Microtendipes sp.	**5.53**	**CG**						
Nanocladius sp.	**7.07**	**CG**						
Nilothauma sp.	**3.9**	**CG**						
Orthocladius sp.	***4**	**CG**						

TABLE 1. BENTHIC MACROINVERTEBRATES COLLECTED FROM LAUREL RIVER PROJECT, AUGUST 1997.								
SPECIES	**T.V.****	**F.F.G.*****	**CRAIG CREEK**					
			MILE 8.7 3ALU10014					
			76303-1	**76303-2**	**76303-3**	**76303-4**	**76303-5**	**TOTAL**
Orthocladius (Euorthocladius sp.)	***6**	**CG**						
Parachironomus sp.	**9.42**	**CG**						
Parakiefferiella sp.	**5.4**	**CG**						
Parakiefferiella bathophila	**5.4**	**CG**						
Parametriocnemus lundbecki	**3.65**	**CG**						
Phaenopsectra sp.	**6.5**							
Polypedilum sp.	***7**	**SH**						
Polypedilum convictum	**4.93**	**SH**						
Polypedilum halterale	**7.31**	**SH**						
Polypedilum illinoense	**9**	**SH**		1	1			2
Pseudochironomus sp.	**5.36**							
Rheocricotopus sp.	**7.3**	**CG**						
Rheocricotopus robacki	**7.28**	**CG**						
Rheotanytarsus sp.	**5.89**	**FC**						
Tanytarsus sp.	**6.76**	**FC**						
Thienemanniella xena	**5.86**	**CG**						
Thienemannimyia gp.	**8.42**	**P**		2				2
Tvetenia bavarica gp.	**3.65**	**CG**						
Zavrelia sp.	**5.3**	**CG**						
Empididae								
Chelifera sp.	***6**	**P**						
Hemerodromia sp.	**7.57**	**P**						
Muscidae	***8**	**P**						
Simuliidae								
Simulium sp.	**4**	**FC**			2			2
Tipulidae								
Antocha sp.	**4.25**	**CG**						
Tipula sp.	**7.33**	**SH**						
TOTAL NO. OF ORGANISMS			**12**	**18**	**12**	**5**	**3**	**50**
TOTAL NO. OF TAXA			**8**	**6**	**6**	**3**	**1**	**18**